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ABSTRACT

We measured the concentrations of lead leached into 4% acetic acid, white port, and a synthetic alcoholic beverage that were stored in lead crystal decanters for 1-, 2-, and 10-day periods at room temperature. In decanters from 14 different manufacturers, measured lead concentrations ranged from 100 to 1800 $\mu\text{g/L}$. The pH of the leaching medium is probably the dominant factor determining the extent of lead leached, with greater leaching occurring at lower pH values. The consumption of alcoholic beverages stored in lead crystal decanters is judged to pose a hazard. (*Am J Public Health*. 1992;82:1671–1673)

Potential Lead Exposures from Lead Crystal Decanters

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Introduction

Significant concentrations of lead, a reproductive toxicant, can be leached by alcoholic beverages contained in lead crystal decanters and glasses for periods ranging from less than 30 minutes to several years.^{1,2} The concentration of lead leached into sherry, port, and scotch whiskey was reported to reach a maximum after 6 to 8 weeks, with a typical concentration of about 1200 $\mu\text{g/L}$.¹ In the present study, the potential lead exposures for people from such beverages stored in lead crystal decanters are compared with the regulatory level established for California's Proposition 65.³

Methods

The method used was a modification of a procedure used to determine lead leached from glazes on ceramic products.⁴ The leaching media included a commercial alcoholic beverage (white port), 4% acetic acid, and a synthetic alcoholic beverage. The latter contained 20% vol/vol ethanol/water, 2000 mg of D-galacturonic acid monohydrate per liter, and 400 mg of citric acid per liter, adjusted to pH 3.0. Selection of the organic acids, concentration, and pH were based on reported values for wine.⁵

Twenty-three lead crystal decanters representing 14 different manufacturers, including five sets of duplicate decanters, were evaluated. The decanters were coded alphabetically, with the duplicate decanters identified as A1, A2 through E1, E2.

Lead concentrations of the three leaching media were less than 2, 40 ± 1.6 , and 6.0 ± 1 $\mu\text{g/L}$ for 4% acetic acid, the syn-

thetic alcoholic beverage, and port, respectively. The corresponding pH values were 2.2, 3.0, and 3.4. The lead concentration for port is the mean and standard deviation for nine bottles. The 10th bottle, which was used for leaching decanter P, contained 28 $\mu\text{g/L}$, sampling without pouring.

A Perkin-Elmer Model 5100PC atomic absorption spectrometer with a Model HGA-600 graphite furnace was used for lead determination. Recoveries of lead in all media were 96% to 107% near the lower limit of quantitation and were 98% to 103% near midrange. Precision was $\pm 8\%$ or better in all cases. All leachate lead measurements were well above the limit of quantitation.

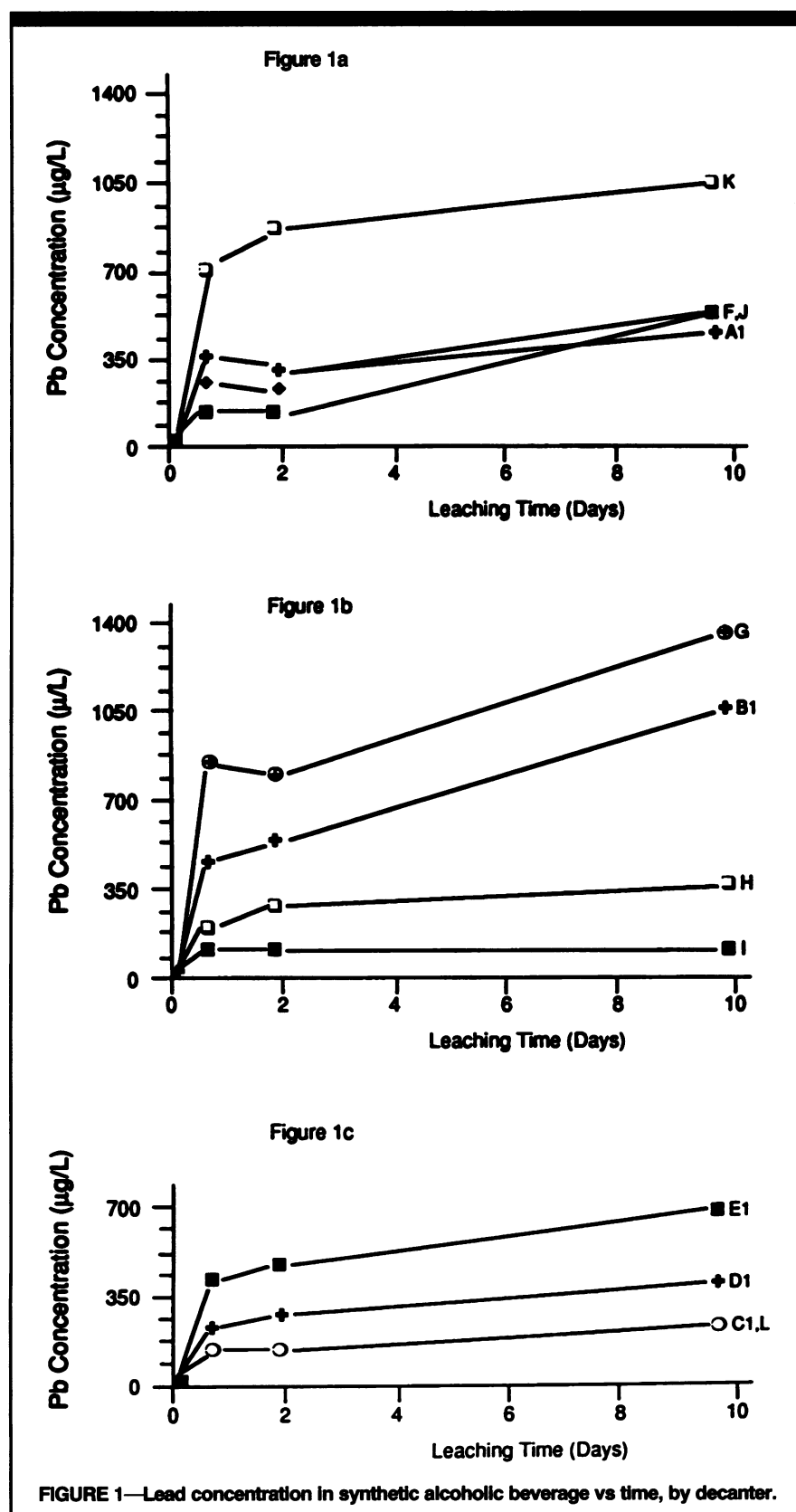
Results

With the synthetic alcoholic beverage used as the leaching medium, Figures 1a–c illustrate the change in leachate lead concentration over time for decanters from 12 manufacturers. The results are uncorrected for the level of lead in the leaching medium. The label "C1, L" denotes an instance in which results for two

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This paper was submitted to the *Journal* November 25, 1991, and accepted with revisions July 6, 1992.



decanter were too close to one another to be resolved. The data points are connected by lines to facilitate comparisons and do not imply any type of curve fitting.

Three decaners (B1, G, and K)

showed concentrations exceeding 1000 µg/L after 10 days, while three others (C1, I, and L) showed concentrations of approximately 170 µg/L or less. In all cases, a rapid increase during the first 24 hours

was followed by a much slower increase in lead concentration.

With 4% acetic acid used as the leaching medium, lead concentration results for the five duplicate decaners were similar and highly correlated with results for those decaners using the synthetic alcoholic beverage. Corrected for the lead contributed by the leaching media, the linear regression equation was

$$\begin{aligned} \text{Acetic acid-leached lead} = \\ -12.9 + 0.39 (\text{synthetic alcoholic} \\ \text{beverage-leached lead}); \\ r = .95. \end{aligned}$$

Based on ratios of mean lead concentrations for the five matched pairs, 4% acetic acid extracted, on average, 60% more lead than the synthetic alcoholic beverage, consistent with its lower pH.

With white port used as the leaching medium, results for five of six decaners ranged between 70 and 480 µg/L. The sixth decanter, after a rapid increase over the first 24 hours, showed an approximately linear increase between 1 and 10 days from about 1000 to 1800 µg/L. Quantitative comparison of leaching results using port with those using other media cannot be made with the present data because matched decaners were unavailable. However, mean lead levels of 862 µg/L in 4% acetic acid and of 524 µg/L in port are consistent with the higher pH of port.

Table 1 lists all 10-day results, expressed as lead concentrations, as well as the total amounts of lead leached into each leaching medium, uncorrected for media contribution. Because the decanter volumes varied by about a factor of 3, comparisons of decanter results based on total lead leached rather than on lead concentrations could, in principle, yield differing conclusions. However, lead concentration results for all 23 decaners are highly correlated with the corresponding total lead ($r = .96$). Thus, no substantial difference is observed in comparing results based on lead concentrations rather than on total lead.

Discussion

The potential health significance of these results can be judged by comparison with the maximum lead exposure levels not requiring warnings under California's Proposition 65: 0.5 µg/day. Assuming a consumption rate for fortified wines of 2 fluid ounces (60 mL) per day, the 24-hour

TABLE 1—Summary of 10-Day Crystal Decanter Leaching Results

| Leaching Medium | Decanter | Leachate ^a Concentration (μg/L) | Total lead ^b (μg/leachate) |
|------------------------------|----------|---|--|
| Synthetic alcoholic beverage | A1 | 427 ± 47 | 342 |
| | B1 | 1015 ± 104 | 744 |
| | C1 | 172 ± 7 | 108 |
| | D1 | 337 ± 24 | 287 |
| | E1 | 617 ± 98 | 481 |
| | F | 477 ± 51 | 377 |
| | G | 1309 ± 72 | 1260 |
| | H | 491 ± 14 | 479 |
| | I | 116 ± 8 | 70 |
| | J | 495 ± 11 | 641 |
| | K | 1163 ± 50 | 529 |
| | L | 164 ± 8 | 85 |
| | Mean | 565 ± 396 | |
| 4% acetic acid | A2 | 488 ± 7 | 405 |
| | B2 | 1904 ± 7 | 1394 |
| | C2 | 261 ± 1 | 166 |
| | D2 | 557 ± 2 | 486 |
| | E2 | 862 ± 2 | 690 |
| | Mean | 814 ± 646 | |
| Port | M | 479 ± 29 | 331 |
| | N | 165 ± 2 | 131 |
| | O | 270 ± 4 | 217 |
| | P | 315 ± 8 | 311 |
| | Q | 133 ± 3 | 143 |
| | R | 1780 ± 1 | 1433 |
| | Mean | 524 ± 628 | |

^aPrecision values for each decanter are 1 standard deviation for successive analyses.^bEquals leachate volume (in liters) × leachate concentration.

storage results with white port and a synthetic alcoholic beverage indicate the potential to ingest 4 to 60 μg of lead. These are 8 to 120 times the Proposition 65 level. After 10-day storage in lead crystal decanters, the corresponding range is 5 to 106 μg of lead, or 10 to 212 times the regulatory level.

Litigation is pending to require appropriate warnings for these and similar crystal decanters when sold in California. Warnings to potential purchasers would be reasonable for such products when they are sold throughout the United States and elsewhere. □

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ABSTRACT

In recent reports, multiple myeloma has been linked to use of hair coloring products containing mutagenic and carcinogenic chemicals. A population-based case-control study in Iowa of 173 White men with multiple myeloma and 650 controls obtained information on hair dye use. Risk of multiple myeloma was significantly elevated (OR = 1.9) among hair dye users and was greatest among those using hair dyes at least once a month for a year or more (OR = 4.3). These data, along with results from other studies, suggest that use of hair dyes contributes to the development of multiple myeloma. (*Am J Public Health.* 1992; 82:1673–1674)

Hair Dye Use and Multiple Myeloma in White Men

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Introduction

Hair dyes are known to contain constituents, including aromatic, nitro, and amino compounds, that are carcinogenic or mutagenic in animals or laboratory tests.^{1,2} Excess risk for multiple myeloma has been associated with occupational exposure to hair dyes in some North American cohorts of female cosmetologists,^{3,4} but not all.⁵ Although little attention has been paid to the potential risk of multiple myeloma from personal use of hair coloring products, a recent study in Nebraska⁶ reported an association among both men and women. A case-control study of multiple myeloma in Iowa, initially designed to investigate the role of agricultural exposures,⁷ provided the

opportunity to evaluate further the association between hair dye use in White men and excess risk of multiple myeloma.

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This paper was submitted to the *Journal* December 2, 1991, and accepted with revisions August 13, 1992.